

WHAT IS CLAIMED IS:

1. An X-ray diffraction apparatus in which:
 - (a) said X-ray diffraction apparatus comprises an incident optical system, a sample support mechanism, a receiving optical system, and receiving-optical-system rotating means, and an X-ray emitted from the incident optical system is incident on a sample supported by the sample support mechanism, and an X-ray diffracted by the sample is detected by the receiving optical system;
 - (b) the receiving-optical-system rotating means has a function to rotate the receiving optical system around a first axis of rotation for changing an angle which is defined by a direction of the X-ray incident on the sample and an optical axis of the receiving optical system;
 - (c) the incident optical system includes an X-ray source and a multilayer-film mirror which has a function to collimate an X-ray emitted from the X-ray source within a plane perpendicular to the first axis of rotation;
 - (d) the sample support mechanism includes attitude controlling means which has a function to switch a condition of the sample support mechanism from a state maintaining the sample to have a first attitude in which a normal line of the surface of the sample is substantially parallel with the first axis of rotation to another state maintaining the

sample to have a second attitude in which the normal line of the surface of the sample is substantially perpendicular to the first axis of rotation;

(e) the sample support mechanism includes first incident-angle controlling means which has a function to rotate the sample around a second axis of rotation which is substantially perpendicular to the first axis of rotation for changing an incident angle of an X-ray which is emitted from the incident optical system and is incident on the surface of the sample in the first attitude; and

(f) the sample support mechanism includes second incident-angle controlling means which has a function to rotate the sample around the first axis of rotation for changing the incident angle of an X-ray which is emitted from the incident optical system and is incident on the surface of the sample in the second attitude.

2. An apparatus according to Claim 1, wherein the attitude controlling means and the first incident-angle controlling means are actualized by a common mechanism.

3. An apparatus according to Claim 1, wherein the multilayer-film mirror includes a first reflection surface with a parabolic shape for collimating an X-ray within a first plane perpendicular to the first axis of rotation and

a second reflection surface with a parabolic shape for collimating an X-ray on a second plane perpendicular to the first plane.

4. An apparatus according to Claim 1, wherein the multilayer-film mirror includes a first reflection surface with a parabolic shape for collimating an X-ray within a first plane perpendicular to the first axis of rotation and a second reflection surface with an elliptical-arc shape for focusing an X-ray on the sample within a second plane perpendicular to the first plane.

5. An apparatus according to Claim 1, wherein the receiving optical system can turn around the second axis of rotation too.

6. An apparatus according to Claim 1, wherein the sample support mechanism includes a mechanism for moving the sample in a direction perpendicular to the surface of the sample, a mechanism for translating the sample in a two-dimensional direction within a plane parallel with the surface of the sample, a mechanism for rotating the sample around two axes of rotation which are orthogonal to each other and pass on the surface of the sample, and a mechanism for an in-plane rotation of the sample.